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EDITORIAL NOTES

SULPHUR REMOVAL

LAST week we published the Report of the Committee of Enquiry on Gas Quality. To-day we give the Report of the corresponding Committee on Sulphur Removal appointed by The Institution of Gas Engineers in July of 1941 to enquire into and make recommendations on the removal of sulphur from town gas. The report epitomizes the whole matter, which has been under discussion for years, on which a vast amount of time has been expended experimentally, and on which too little practical application has been made. There have been too many gas engineers who have agreed in theory with the removal of sulphur, have been convinced that the step is the right one, but who for some reason or another have failed to establish at their own works the comparatively simple procedure involved. We said about the Gas Quality report last week that if the recommendations contained in it were put into practice the standard of gas supply would at once be raised. The same comment applies to the Sulphur Removal report, and we look to the time when "Sulphur must go" will be replaced, to the benefit of gas undertaking and gas consumer, with "Sulphur has gone." The case for the removal of sulphur from town gas is as cast iron as any case we have come across, and the hesitancy regarding it shown by the Gas Industry generally has appeared to us both bewildering and astonishing, for with a sulphur-free gas we have an enormous amount to gain.

Hesitancy to adopt some process of sulphur removal cannot have been caused by fear of the cost of working it. The sulphur content of town gas can be reduced to about 10 grains per 100 cu.ft. by processes which have been proved by experience. And we quote from the report—the cost of effecting such a reduction will be from *nil* up to 0.15d. per therm according to the process used. This is inclusive of capital charges. By a combination of the Gas Light and Coke Company's catalytic process with one of the processes for benzole recovery—*i.e.*, the active carbon process or the oil-washing process—the cost of sulphur removal down to 3 grains per 100 cu.ft. will be from 0.15d. to 0.22d. per therm, again inclusive of capital charges. These cost figures were based upon pre-war prices according to estimates at the disposal of the Committee. It should be noted that nitric oxide is removed along with the sulphur in the catalytic process; and where this is used, therefore, there will in certain areas be a reduction in the nuisance caused by gum. When we consider for a moment the cost of maintenance of apparatus—domestic and large scale—directly due to a sulphur-laden gas, the fact that for certain industrial processes a low-sulphur gas is essential, the limitations set on its use for space heating, and the prejudicial influence of sulphur-laden gas on the prestige of the Industry, the cost of treatment for the removal of sulphur down to 3 grains per 100 cu.ft. appears to us a matter of no consequence. Regarding flueless heating—obviously a field of great extent with a sulphur-free gas—the Committee recalls the 1936 report of the Advisory Committee of the Royal College of Physicians, which assumed that 50% of the sulphur compounds would be absorbed by the walls and furnishings. The Sulphur Removal Committee has—wisely, we think—disregarded any possible removal in making its recommendation that the ultimate objective of the Gas Industry should be to secure a sulphur content not exceeding 3 grains per 100 cu.ft. With such a gas burning at the rate of 1 cu.ft. per hour per 100 cu.ft. of space in a room in which there is half an air change an hour there should be no perceptible smell.

The two outstanding recommendations of the Committee are that as a first step the organic sulphur compounds in all supplies of town gas should be reduced to 10 grains per 100 cu.ft. before the gas is distributed to the public, and that immediate steps should be taken by all gas undertakings, as soon as circumstances permit, to achieve this result; and, secondly, that gas undertakings should be encouraged to make better use of the facilities available to enable them to attain the lower limit of 3 grains per 100 cu.ft. Arrangements have been made, it will be noted, whereby it is possible for any undertaking which desires to do so to install and operate a catalytic plant of the Gas Light and Coke Company's type. We take it, then, that the 10 grains should be regarded only as a first and immediate objective—*i.e.*, immediate when circumstances permit—and by no means as a cause for satisfaction or congratulation, and that the real objective should be to supply a gas containing not more than 3 grains of sulphur per 100 cu.ft. One point is not made clear in the report, and that concerns the calorific value of the gas supplied. Are we to assume that in expressing the sulphur content in grains per 100 cu.ft. the Committee had in mind as basis a gas of calorific value *circa* 500 B.Th.U. per cu.ft.? If we regard as a broad proposition that 2 cu.ft. of, say, 250 B.Th.U. has the same heating effect as 1 cu.ft. of 500 B.Th.U. gas, then a 250 gas containing 3 grains of sulphur per 100 cu.ft. is, from the sulphur removal angle, equivalent to a 500 gas containing 6 grains per 100 cu.ft. Can an undertaking supplying what may be termed low-grade gas reduce its sulphur content comparably with an undertaking supplying high-grade gas—*i.e.*, in the example cited to one and a half grains per 100 cu.ft.? We will not, however, labour what is perhaps a nice point. The overriding consideration is that we *must* get down to 10 grains, and the sooner we get down to 3 grains per 100 cu.ft. the better.

Concluding our remarks last week on the report of the Gas Quality Committee we said that in the framing of new legislation no doubt cognizance will be taken of the Committee's recommendations. This applies equally to the findings of the Committee on Sulphur Removal.

THE GAP

THE debate on coal was concluded in the House of Commons last week, and as far as the Gas Industry is concerned we have little to add to our note in the "JOURNAL" of Oct. 7. From the general angle there was the announcement by Sir John Anderson of the War Cabinet's decision that men are not to be released from the Field Army for the mines. He declared that about 3,000 or 4,000 men now in this country were the most that could be released, and that such release would be wrong policy. At the end of the debate Mr. Shinwell gave notice that the Labour Party will wish to raise the subject again in the near future. The Labour Party also laid strong emphasis on rationing, but there was no general support in the House for the demand that compulsory rationing should be introduced at once. The Minister of Fuel and Power touched again on the question of absenteeism in the mines, saying that the bad attenders were mainly those between the ages of 20 and 30, and he repeated his belief that, with co-operation on the part of all producers and all consumers, we should surmount our winter fuel difficulties—that it was within the power of the people of this country to close, without hardship to themselves, the deficiency gap of 11,000,000 tons in coal production. Towards the close of the debate Sir John Anderson referred to this, saying that the Government was satisfied it could bridge the gap with economy and the existing man-power for this winter provided there was good will, but it would not, he added, be done beyond this winter. We find it difficult to interpret the exact meaning of this statement or to understand its implications, though it would seem to take cognizance of stock depletion.

Early in the debate Mr. Shinwell had asked the House to

exclude "all the silly nonsense about absenteeism," which struck us as a singularly surprising request surprisingly expressed. We were impressed a few days previously with what Lord Davies had to say on this subject at the general meeting of Ocean Coal and Wilsons, Ltd. He was referring to the fact that the average output per man is below what it was in pre-war days, and expressed the view that if the quantity produced per shift was equal to the pre-war output all the country's needs for wartime industrial production and reasonable domestic consumption would be satisfied. Concerning absenteeism he said: "The net result of the increases in wages resulting from the report of Lord Greene's Committee of investigation and the other increases since the war is that, if the miners are prepared to work regularly and to produce approximately their pre-war output, they will be able to earn 59s. 6d. per week in excess of their pre-war wages. In considering this figure it should be borne in mind that both sides of the industry have agreed that the increase in the cost of living amounts to 16s. per week. It is therefore not unreasonable to expect a greater effort and a larger, not a lesser, output."

This, we think, should be read in conjunction with Major Lloyd George's statement mentioned above that the "bad attenders" are mainly those between 20 and 30 years of age. The older men, stated the Minister, are faithfully doing their part. In regard to the potentialities of available man-power the *Iron and Coal Trades Review* mentioned in its issue of Sept. 25 the estimate that a reduction of only 2½% in the current rate of voluntary absenteeism at the coal face would mean an addition to the national output of approximately 5¾ million tons. And it went on to say that if production could be raised to the average level of the best four weeks' production in 1941 an extra 11 million tons of coal would be raised per annum; while an additional half-hour to the present effective working time per shift would yield approximately at the rate of 15 million tons per annum after allowing for a slightly reduced rate of output during the extra working time. "The extent of the latent productive power of the industry," it added, "may be roughly measured from these statistics, and if it were only partially exploited it would increase the national output sufficiently to protect the nation against at least some of the hardships that are threatened by the current shortage, if it did not also see the nation comfortably through the coming winter, excepting, of course, war hazards against which no precautions can be taken."

It is neither our function nor intention to go further into this particular matter, though necessarily the Gas Industry is vitally concerned with the coal production situation. It is also vitally concerned with its use, and gas undertakings throughout the country are backing up in various ways the Government's demand for fuel economy. We mentioned last week the gratification expressed by Major Lloyd George in the House at the reduction in gas consumption, since the voluntary fuel economy campaign, of over 16% in the area of one of our biggest and most important manufacturing cities. We know that the gas undertakings of other cities and towns, large and small, are doing what they can in the same direction to help to bridge the gap. The Industry could adduce more figures of a striking nature were it not for the fact that many consumers are turning to gas in order to conserve their stocks of coal against the winter—in other words, economizing for the time being in coal, but at the expense of gas, which is readily available at every tap.

WAR DEMANDS FOR TAR

IT would appear that there has been a certain amount of confusion resulting from a memorandum issued a few weeks ago by the Ministry of Works and Planning concerning the use of tar for roads. The memorandum stated that the use of tar for roads had to be confined to essential requirements, that tarmacadam came into the category of "scarce materials," and that substitutes enumerated should be adopted where practicable with a view to avoiding the use of tar. The application of the memorandum was, we believe, widely interpreted as being general. The Ministry has now, however, issued a further statement making the matter clear. It points out that the greatest economy in the consumption of tar is necessary, places tarmacadam again in the list of "scarce materials," and sets out substitutes for it in use. But it emphasizes that the memorandum does not apply to public highways for which local highway authorities are responsible, thus dissociating it from anything which is the concern of the Ministry of War Transport, under whose jurisdiction come the highways. The memorandum, it should be explained, is one of a number of Economy Memoranda being issued by the Committee on Building Materials Standardization of the Ministry of Works and Planning, and the Civil Licensing Division of the Ministry insists on specifications for civil building complying with the requirements of the memoranda.

It is natural, of course, that Service calls account for the bulk of the tar requirements, but this does not mean that supplies of material to surveyors for purposes such as maintenance work and surface dressing are dried up; it is necessary that maintenance work should be carried out, though within limitations imposed by changing wartime circumstances and demands. We have said it is natural that the calls of the Service departments should come first. These calls, from Navy, Army, and Air Force, have been and are heavy, and we think they have been and are being met in a manner both able and gratifying. The demands are varied. The war brought to the tar industry a set of entirely new problems, and as month succeeded month the variety in demand increased. We cannot, for obvious reasons, enter into detail regarding these diverse applications; the salient fact is that tar has done and is doing an exceedingly good job of work. Fortunately within the Industry technical service, experience, and advice was, pre-war, on a well-organized basis—and we do not hesitate to refer specifically to the British Road Tar Association. The fact that the Association's advice is so frequently sought, and is available to such good practical effect, is a most pleasing feature. We know that this assistance is appreciated by those who seek it, and we feel sure that the co-operative understanding which is being developed, the lessons which are being learned, and the experience which is being gained will prove of great worth in the future and invaluable in the immediate post-war period.

COMPULSION—NOT ADVICE

WHEN we last discussed the question of the use of producer gas for motor transport in this country—it was in our issue of Aug. 5—we summed up the situation by saying that it could hardly be considered as exhilarating, that the trouble was not steel supply but the availability of suitable fuel for the purpose. It is interesting to turn to what is happening in Germany, where a year ago a drive for the production of producer gas plants for transport was begun. Lorry and omnibus contractors were encouraged to make the change then from diesel oil and petrol to producer gas. The diplomatic correspondent of *The Times*, in the issue of Oct. 8, stated that advice has now become compulsion; and we give some of his remarks without comment. Producer gas, it has been decreed, must take the place of petrol in almost all German lorries, stationary engines, and even marine engines. All diesel lorries with a loading capacity of 2 tons or more and all omnibuses and tractors of more than 25 h.p. must change over without delay. Lighter lorries and omnibuses plying on short journeys, it is stated, will run on high pressure gas; other categories will use low pressure gas. A central authority has been established to direct the changes "by all possible means."

The decree, remarked *The Times* correspondent, is issued on a note of urgency. And the reason? Germany controls large supplies of oil in her own brown coal fields and in Rumanian and Polish fields. The armed services have never found themselves short, except when local transport has broken down. But during recent months the German need of petrol has grown enormously. If occupied areas in Russia are to be exploited, innumerable lorries have to be supplied with fuel. The area which Russia supplied from Baku is now being run by Germany

—without Baku. The German newspapers are filled with accounts of future development in the Ukraine and Black Sea area. If Germany is to launch a military offensive in the Middle East, large stocks will be needed in reserve, and it is concluded that the further curtailment in the use of petrol in Germany "must be taken as evidence not so much of a desperate or immediate critical shortage as of strict conservation for future needs."

Personal

For the first time since the formation of the Company in 1816, the Liverpool Gas Company has appointed a General Manager. The appointment follows the intimation that Mr. ERNEST ASTBURY, the Chief Engineer, will retire on Dec. 31. this year, and Mr. C. H. LEACH, the present Secretary and Treasurer, becomes General Manager and Secretary from Jan. 1, 1943.

Mr. Leach, who is a Chartered Accountant and M.A., was educated at the Manchester Grammar School and Oxford University. He was appointed to the staff of the Alliance and Dublin Consumers' Gas Company in October, 1927, as Assistant Secretary. He joined the staff of the Liverpool Gas Company in 1939, and was appointed Secretary and Treasurer on Oct. 1, 1941.

Mr. Ernest Astbury has spent nearly forty years with the Liverpool Gas Company following engineering experience at Smethwick and Retford. He was appointed Chief Engineer in November, 1937, and has held many offices in the Gas Industry, and has been Deputy Gas Adviser to the Regional Commissioner. In November, 1938, he was appointed an Officer of the Order of St. John of Jerusalem and this year was awarded the O.B.E.

Mr. WILLIAM FLETCHER becomes Chief Engineer and Mr. J. G. O. DRAKE becomes Treasurer.

Mr. Fletcher is a member of The Institution of Gas Engineers and has received all his engineering experience in different branches of the Liverpool Gas Company. He is Senior Vice-President of the Manchester District Association of Gas Engineers.

Mr. Drake is a Chartered Secretary and an Associate of the London Association of Accountants. He also spent all his business career with the Company except during his War service in France in 1914–18.

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Acting on medical advice, Mr. W. H. JOHNS, M.I.Mech.E., Engineer and Manager of the Swansea Gas Light Company, has found it advisable to retire on superannuation owing to ill-health. His resignation will become effective at Dec. 31, and in the meantime the Directors have granted him sick leave of absence until that date.

Mr. ERNEST ABLETT, F.C.I.S., hitherto Secretary and Assistant Engineer, has been appointed Engineer, Manager, and Secretary.

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Mr. W. M. GLEDHILL has been appointed to succeed the late Mr. A. Cuthbert as Engineer and Manager of the Stirling Gas Light Company. Mr. Gledhill served his pupilage with Messrs. West's Gas Improvement Company, Manchester. Mr. Gledhill is already well known in Scotland. His first appointment was as Assistant Engineer at Stirling from December, 1932, to July, 1938, when he moved to a similar position at Worcester. In 1940 he was appointed Engineer and Manager of the Gas Undertaking of the Marple Urban District Council.

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Mr. W. B. RICHARDS, Director and General Manager of Keith Blackman, Ltd., completes 50 years' service this month, and the Directors and Staff have presented him with a Grandfather Clock and a personal gift for his wife. In returning thanks for the gifts, Mr. Richards drew attention to the fact that when he joined the Company in 1892 the total number employed by it was under 100, whereas at the present time the Company's employees number about 2,000.

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Major E. H. CLARRY has been appointed a Director of Alexander Comley, Ltd., of Birmingham, in succession to the late Mr. J. H. Willis. Major Clarry was articled to Mr. H. D. Madden of the Cardiff Gas Light & Coke Company, and was for some years Assistant Engineer at their Grangetown Works, later opening up the Cardiff Office for Alexander Comley, Ltd., who, besides having an extensive coal business, are agents for Messrs. Clayton, Son, & Co., Ltd., of Leeds, and Messrs. Clapham Bros., Ltd., of Keighley.

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Mr. L. G. ROBERTS, Technical Assistant to the County Borough of St. Helens Gas Department, has been successful in the 1942 examination for the degree of B.Sc.(Engineering) of London University for external students. Mr. Roberts started his training at Tipton Corporation Gas Department in 1930, and served as Technical Assistant from 1935, until going to St. Helens on Jan. 1 of this year.

Mr. A. McDonald, General Manager and Secretary of the Castleford Group of Gas Undertakings, recently addressed the Local Rotary Club on the Battle for Fuel. In the course of his address he referred to the essential need for economy in all fuels, and indicated how savings could be effected. By means of a set of demonstration dials he instructed the audience how to read their gas meters.

Obituary

The death occurred on Sept. 7 of Mr. S. E. LINDER, B.Sc., at the age of 73 years. Mr. Linder was Assistant to the Chief Inspector of Alkali Works, &c., for 36 years, having entered the Department in 1892. His work in connexion with the analysis of ammoniacal liquors is well known, being described in the Technical Index to the Alkali Reports, 1894 to 1917, published in 1919.

Letter to the Editor

Charges to Prepayment Consumers

DEAR SIR,—In reply to the question you raise in your issue of Sept. 23, p. 460, regarding the system of charge for prepayment consumers, we charge 5d. extra per 1,000 cu.ft. (1.16d. per therm) on gas consumed by slot meter, up to 6,000 cu.ft. (25.8 therms) per quarter, and any gas consumed in excess of that quantity is charged at the same rate as ordinary consumers.

By this means, no prepayment consumer can pay more than 10s. per annum in excess of the amount that would be charged to an ordinary consumer for the same quantity of gas.

Our rates are:

Ordinary consumers.	Per 1,000 cu.ft.	Per therm.
Up to 6,000 cu.ft. per quarter (25.8 therms) . .	3s. 4d. .	9.3 pence
Gas consumption in excess of 6,000 cu.ft. per quarter	2s. 4d. .	6.5 ,,
Slot consumers.		
Up to 6,000 cu.ft. per quarter (25.8 therms) . .	3s. 9d. .	10.46 ,,
Gas consumption in excess of 6,000 cu.ft. per quarter	2s. 4d. .	6.5 ,,

Gas Works, Dunfermline. Yours faithfully,
Oct. 8, 1942. JAMES CAMPBELL.

"The Gas Industry of the Future"

Reprints of these articles are now sold out.

Potato Diplomacy

The Ministry of Food recently concluded a Potato Cookery Exhibition which was staged in an empty shop at Piccadilly Circus. The Central European Chamber of Commerce co-operated with the Ministry by organizing a novel competition.

Famous chefs could be seen every day on the platform in the Piccadilly shop preparing—with the help of a gas cooker—a whole day's meals out of easily obtainable vegetables and potatoes. Each day a chef or team of chefs of a different nationality did the cooking. Judges watched their performance and picked out the best two dishes every day, neither of which had to cost more than 6d.

On Thursday, Oct. 1, came the Grand Finale of the Competition at the Ministry of Food. Before distinguished diplomats and members of the resident national Governments, teams from Czecho-Slovakia, Austria, Poland, Jugoslavia, and Greece competed in presenting the most interesting and useful wartime potato dishes. Gas cookers had been specially installed for the competition in the Conference Room of the Ministry of Food so that each team had a gas cooker and preparation table on which to work.

Among the guests who watched the cookery were Mr. W. J. Sandeman, Mr. T. Brown, Col. H. C. Smith, Dr. E. W. Smith, Mrs. Abbott, Mr. P. J. Lucas, Mr. C. S. Rose, and Mrs. Eileen Murphy.

The National Association of Girls Training Corps was formed in January of this year at the instance of the Board of Education. The number of Companies registered is now 781, and many more are in process of formation. Included in the basic training is a Handywoman's Course. The Women's Gas Council and the British Commercial Gas Association have prepared a pamphlet on the use and maintenance of gas appliances for use in this course.

With a View to economizing fuel the Minister of Fuel and Power has (as already announced) issued a General Direction under the Control of Fuel Order restricting the permissible lighting in certain classes of premises—*viz.*, shops, hotels (including inns), restaurants, and places of public entertainment, sport and meeting. (Museums, picture galleries, hospitals, schools and other educational institutions are not covered.) The full text of the Direction (Statutory Rule and Order No. 1930 of 1942) can be obtained from H.M. Stationery Office, price 1d. The restrictions took effect from Oct. 1. The permitted limits are expressed in watts per square foot of floor area for electricity and in specified floor areas for various types of gas mantle.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

SULPHUR REMOVAL FROM GAS

REPORT OF THE COMMITTEE OF ENQUIRY ON SULPHUR REMOVAL*

THE Committee of Enquiry on Sulphur Removal was appointed by the Council of The Institution of Gas Engineers on July 30, 1941, "To enquire into and make recommendations on the removal of sulphur from town gas."

Part I.—The Need for Further Elimination of Organic Sulphur Compounds from Town Gas

Town gas, after purification to conform with the existing statutory requirements, still contains small amounts of organic sulphur compounds consisting chiefly of carbon-disulphide, thiophenes, mercaptans, and carbonoxysulphide. During the burning of the gas these compounds form sulphur dioxide and sulphur trioxide, in a ratio of not less than 3 : 1 by volume.

It is owing to the effects produced by these oxides of sulphur in the products of combustion, and not to any influence directly exerted by the parent substances in the gas itself, that it has been felt desirable to investigate means of effecting further removal of these organic sulphur compounds. Even in the concentrations in which they occur in the products of combustion, the oxides of sulphur produce undesirable effects, causing corrosion of the materials of the appliances in which the gas is burned or, owing to their pungent odour, making presence of the burned gases perceptible even under the conditions of further dilution which occur during the use of flueless appliances for heat purposes.

Corrosion of Appliances Caused by Products of Combustion of Town Gas.

The corrosive action of the products on apparatus leads not merely to deterioration of the appliance both in appearance and in structure, but what is more important, may, in certain cases, cause obstruction of the flue-ways and affect seriously the standard of combustion attained.

Corrosion of appliance materials is to be expected in apparatus of high thermal efficiency where the gas is burned in a confined space, especially if the heater surfaces remain at relatively low temperatures; water-heating apparatus is particularly liable to attack.

Such heaters are classified as "condensing" or "non-condensing," depending on whether liquid condensation products are formed more or less continuously during use or not, but in general some condensate is formed even though it may be dried up before the accumulation has been sufficient to produce a running liquid.

Investigations of the corrosion of a number of metals by the products of combustion of town gas under condensing conditions, carried out by the Joint Research Committee at Leeds University,[1] showed that corrosion becomes steadily less as the sulphur compounds are reduced, although not in direct proportion. When the sulphur content was reduced below 8 gr. per 100 cu.ft., the rate of corrosion of all metals, with the exception of lead, showed a marked decline, which continued steadily as the sulphur content was reduced. With lead and lead alloys, on the other hand, there was some increase in the rate of corrosion when the sulphur content was reduced below 4 gr. per 100 cu.ft., although at higher concentrations the corrosion of these metals was negligible.

Corrosion experiments carried out under conditions of partial condensation and re-evaporation showed the conditions of attack to be much more severe, the corrosion being about double that occurring under conditions of full condensation.[2] Here, again, reduction in the sulphur content of the gas led to a reduction in the amount of corrosion.

No direct evidence has been submitted to the Committee to indicate the effects to be expected of supplying a town gas completely free from sulphur, but there is presumptive evidence to show that in such case there would occur what may be termed residual corrosion, due to nitric acid formed by the oxidation in the flame of the nitrogen in the air and the gas, and, if may be, of traces of nitrogen compounds in the gas.

The presence of sulphur trioxide in flue gases causes their dew point to be raised by an amount which increases as the excess air in these gases decreases.[3] The tendency to condensation is thus increased. Condensation of flue gases is often deleterious to flue or chimney materials.

Physiological Effects of Sulphur Oxides.

Both sulphur dioxide and sulphur trioxide are present in the combustion products of town gas. They are formed by the oxidation of the organic sulphur compounds such as carbon disulphide. The ratio of sulphur dioxide to sulphur trioxide—usually varying between 3 to 1 and 5 to 1—is important since sulphur trioxide becomes perceptible by smell when present in the atmosphere to the extent of 0.00002% compared with 0.0002% for sulphur dioxide. For the threshold of perception (vide *Report of Royal College of Physicians*, 1936, p. 21).

The concentration of sulphur oxides in the atmosphere of a room heated by a flueless heater depends on:

(*a*) The original sulphur content of the gas.
(*b*) The rate of combustion.
(*c*) The volume of room.
(*d*) The rate of air change.
(*e*) The absorption, if any, of the sulphur oxides within the appliance or by the walls and furnishings of the room.

Owing to the differences in styles of furnishing and in buildings and in treatment of wall surfaces, the Committee considers it advisable for the purpose of the present Report to disregard any possible removal of sulphur oxides from the atmosphere of a room by such agents. Accordingly it considers that the ultimate objective of the Gas Industry should be to secure a sulphur content not exceeding 3 gr. per 100 cu.ft. With such a gas burning at the rate of 1 cu.ft. per hr. per 100 cu.ft. of space in a room in which there is half an air change per hr., there should be no perceptible smell due to the products of combustion. The Advisory Committee of the Royal College of Physicians, in its 1936 Report, assumed that 50% of the sulphur compounds would be absorbed by the walls and furnishings.

Effect of Sulphur Content on Industrial Processes and Appliances.

Since, in the majority of industrial processes and appliances, coal, coke, or oil were formerly used, a low sulphur content of town gas is not in general necessary, although a gas with a low sulphur content would be of advantage where there are large numbers of air heaters and other flueless industrial appliances and, so far as effect of sulphur oxides on the dew point is concerned, where there are large numbers of gas-fired boilers and central-heating plants. In certain cases where a low sulphur content is essential, the problem has been solved by installing individual sulphur removal plants, for example, small catalytic plants. These plants are used particularly in connexion with bright annealing and heat treatment of metals in the semi-finished state. A low sulphur content of town gas would, however, reduce the number of processes for which special sulphur removal plants are now required.

The gas supply can be treated at a lesser cost at the gas-works than at an individual consumer's premises. For example, for a works having an output of 2 mill. cu.ft. of gas per day, the capital outlay for a catalytic plant to treat the whole of this gas would be the same as that for installing 25 or 50 (depending on size) smaller plants at consumers' premises.

When town gas of high sulphur content is used in the table working of glass, clouding is produced. In a few factories small active carbon plants have been installed for the removal of the organic sulphur compounds from the gas.

When town gas is used in the ceramic industry the quality of the products of combustion always compares favourably with that of the products of the alternative fuel, raw coal, but in modern gas-fired kilns with open setting of the ware a relatively low content of organic sulphur in the gas appears to be desirable.

Part II.—Processes for the Removal of Sulphur

One of the first processes adopted for the removal of sulphur from town gas was the catalytic process worked out and operated by the South Metropolitan Gas Company and described by the late Dr. Charles Carpenter to The Institution of Gas Engineers in 1914.[4] The process was operated from 1913 to 1939. Rather more than half the gas made was treated by the Company, the sulphur content being reduced to about 10 gr. per 100 cu.ft. The cost of operation of this process was 0.0779d. per therm exclusive of capital charges. This process is not now being operated by the South Metropolitan Gas Company.

There are available for the reduction of sulphur to 10 gr. per 100 cu.ft. the following processes, descriptions of which have been published: [5, 6]

(*a*) The active carbon process of British Carbo-Norit Union Limited or of Sutcliffe Speakman and Co., Ltd.
(*b*) The Gas Light and Coke Company—W. C. Holmes and Co., Ltd. oil washing process.
(*c*) The Gas Light and Coke Company's catalytic process.

Processes (*a*) and (*b*) involve a substantially complete extraction of benzole from town gas. There are now some 25 plants in operation using one or other of these processes, with a total rated capacity of 190 mill. cu.ft. of gas per day. Process (*c*) has been tested on a large working scale over a period of several years, but has not yet been installed at more than one works.

When coal of abnormally low sulphur content is carbonized, gas containing no more than 10 gr. of sulphur per 100 cu.ft. may be obtained after recovery of benzole by any means and without necessarily using any of the processes mentioned under (*a*), (*b*) or (*c*) above. Indeed, in a few instances the organic sulphur content of the gas is stated to be below 10 gr. per 100 cu.ft. prior to benzole recovery.

The extraction of benzole from carburetted water gas is not normal

* I.G.E. Communication No. 250.

practice, and unless the sulphur content of the coke is high the sulphur content of the purified water gas or producer gas made from it does not substantially exceed 10 gr. per 100 cu.ft.

By a combination of process (*c*) with (*a*) or (*b*) the sulphur content can be reduced to about 3 gr. per 100 cu.ft.

When the benzole process adopted is that of oil washing it should precede the catalytic process. If an active carbon process is used it is preferable for this to follow the catalytic plant; the life of the active carbon is then prolonged and a benzole of low sulphur content will be produced. The location of the plant may need special consideration where carburetted water gas is made. It should also be noted that nitric oxide is removed along with the sulphur in the catalytic process. Where this process is used, therefore, there will be a reduction in the nuisance caused by gum in certain areas.

Since purified water gas and producer gas normally contain more than 3 gr. of sulphur per 100 cu.ft., it will be necessary to treat any such gas by the catalytic process in order to reduce the sulphur to 3 gr. But, as mentioned above, since it is not normal practice to remove benzole from water gas, the latter should be treated separately from coal gas or benzole should first be removed from the coal gas.

The catalytic process is particularly suitable for treatment of water gas or producer gas since it is the most effective means of removing carbon oxysulphide, which forms a fairly large proportion of the total organic sulphur content of water gas or producer gas. This has not yet been tried on a commercial scale.

It is understood that, as soon as circumstances permit, the Gas Light and Coke Company intends to erect another catalytic process plant, which will incorporate certain modifications in design resulting from the experience gained in the successful operation of the present plant at Harrow. Arrangements have been made whereby it is possible for any undertaking which desires to do so to install and operate a plant of this type.

There is no process in use on a large scale for securing the complete removal of sulphur from town gas, but the work on sulphur removal which is now being carried out at Leeds University on behalf of the Gas Research Board has shown that, with a suitable catalyst under somewhat higher temperature conditions, it is possible to reduce the sulphur content of gas from 25 gr. to about 1 gr. per 100 cu.ft. This work, however, has not advanced beyond the laboratory stage.

Cost of Sulphur Removal.

The process or combination of processes which is necessary for sulphur removal will depend in some degree upon the sulphur content of the gas after removal of hydrogen sulphide and in some degree upon the sulphur concentration which is to be permitted in the town gas. In most circumstances there is a choice of processes. Thus it becomes difficult to make a general statement as to the cost of sulphur removal.

In certain circumstances, when benzole recovery is practised, no extra cost is likely to be incurred in reducing the sulphur content to about 10 gr. per 100 cu.ft. In one case, however, where process (*b*) mentioned above was used, the extra cost was estimated to be 0.07d. per therm, inclusive of capital charges.

If the Gas Light and Coke Company's catalytic process is used the cost will be 0.15d. per therm inclusive of capital charges, and based upon pre-war prices according to estimates at the disposal of the Committee. This cost is applicable to a plant with a steady base load throughput of gas. The cost of treatment of carburetted water gas or other peak load gas would be somewhat higher, depending on the load factor.

By a combination of benzole removal with the catalytic process the sulphur content can be reduced to 3 gr. per 100 cu.ft., when the cost of sulphur removal from the coal gas will be from 0.15 to 0.22d. per therm, inclusive of capital charges.

Part III.—Conclusions and Recommendations

Conclusions.

Owing to the effects of the products of combustion of sulphur compounds in town gas, the cost of maintenance of apparatus is increased, the use of town gas for space heating is limited and the prestige of the Industry is prejudicially influenced.

The sulphur content of town gas can be reduced to about 10 gr. per 100 cu.ft., or slightly less, by processes which have been proved by experience. When certain coals of very low sulphur content are carbonized, an appreciably lower sulphur content of the gas may be obtained.

The cost of effecting a reduction to 10 gr. per 100 cu.ft. will be from *nil* up to 0.15d. per therm according to the process used.

A combination of the catalytic process with one of the processes for benzole recovery will be necessary in most circumstances if a lower limit of 3 gr. per 100 cu.ft. is to be secured. The cost of the combined processes will vary from 0.15 to 0.22d. per therm.

Any process installed to attain an immediate reduction to 10 gr. per 100 cu.ft. will form a part of the combination of processes ultimately necessary for a reduction to 3 gr. per 100 cu.ft.

Recommendations.

The Committee, therefore, recommends that:

(1) As a first step the organic sulphur compounds in all supplies of town gas should be reduced to 10 gr. per 100 cu.ft. before the gas is distributed to the public and that immediate steps should be taken by all gas undertakings, as soon as circumstances permit, to achieve this result.

(2) In view of the advantages which accrue when the sulphur content is reduced to 3 gr. per 100 cu.ft., gas undertakings should be encouraged to make better use of the facilities available to enable them to attain this lower limit.

(3) The possibility of the attainment of a still lower limit of sulphur content should be kept continually under review and processes designed to ensure this should be examined as they become known. Should a practical process be developed, steps should be taken to bring it to the notice of all gas undertakings.

(4) The possibility of obtaining a lower limit than 10 gr. of sulphur per 100 cu.ft. should not be allowed to cause delay in giving effect to Recommendation (1) above.

H. HOLLINGS (*Chairman*).
G. E. CURRIER.
H. HARTLEY.

[An Appendix to the Report gave a list of memoranda submitted to the Committee and of evidence.]

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Twenty-One Years' Progress

The Visco Engineering Co., Ltd., Croydon, has just come of age and the occasion has been marked by the issue of a brief history of the Company's progress since it was formed by Mr. F. Curt Smith, the present Chairman and Managing Director, in 1921. Its first purpose was to market the Visco air filter, the first all-metal air filter using oil film-covered surfaces. Three years later Visco water-cooling towers made their appearance in industry, and as a natural development a ventilating department was opened in 1927, and a dust-collecting department in 1928. In 1931 a start was made with industrial vacuum cleaners. The business grew continually and the move to the present factory took place in 1932, in which year the Visco rotating self-cleaning filter was introduced.

The range of dust-collecting equipment now manufactured extends from small units for use with single machine tools to large centralized automatic plants. Meanwhile, water cooling has not been neglected. a notable development being the Visco "Steelshell Forcedraft" cooling unit. From water cooling to oil cooling was a logical development, and the Visco Patent "Sprayblast" oil cooler introduced in 1939 has proved just as successful as the Visco water coolers. Considerable progress in industrial vacuum cleaning is recorded, a number of special plants having been installed in factories engaged on war work. Many ventilating and air-conditioning schemes have also been successfully carried out.

A Meeting of the London and Southern District Junior Gas Association will take place at 6.30 p.m. at the Westminster Technical Institute, S.W. 1, on Friday, Oct. 16, at which Dr. S. Pexton, of the Gas Light and Coke Company, will read a Paper entitled "The Fuel Requirements of Carbonizing Plant."

The Colonial Gas Association, Ltd., has declared dividends for the year ended June 30, 1942, at the full rate on the 4% preference shares, and at 5% (against 6%) on the ordinary shares. The net profit amounted to £84,328, after providing £36,000 for taxation, and £12,000 for renewals in addition to usual depreciation. There remains a balance of £3,100 to be carried to the next account. Gas sales by the Association's works increased by 18.8%, with 8.7% increase by subsidiaries. Coal cost £22,000 more. The annual general meeting was held in Melbourne on Oct. 7.

NO COMPLAINTS FROM THE DISTRICT*

By

L. W. ANDREW, B.A., B.Sc.

(*Concluded from p. 26*)

Apart from the rich it seemed that people expected to suffer inconvenience in the English winter. Background heating advertisements had often been seen, but the average person did not feel that the discomfort to which he had been accustomed would justify the expense of buying and using an additional appliance. Those who had extra heating in the hall or the living room were without exception delighted and agreed that advertized claims were correct. Those who had not tried it did not realize what they missed. Even among district personnel there was a marked difference in enthusiasm between those who had personal experience of background heating and those who had not.

Summing up, I feel that in the pre-war period official complaints were no index of what the user really thought about gas.

War Conditions

A very different picture is presented. The ordinary person is even less likely to complain, and in spite of reduced maintenance only serious defects are likely to be bothered about. A healthy sign is, however, the interest shown in the possibility of fuel rationing, and a much more real understanding of the relative values of different fuels should result.

The professional complainer is still with us, but even he is less active, probably from a sense of the difficulties of the gas undertaking at the moment. There is no longer time to deal with him as fully as in the past.

In spite of an inevitable reduction in maintenance there seems to be no indication of any serious complaints or any increase in minor complaints. It is particularly encouraging that the reduction in ventilation standards due to the blackout has not been accompanied by an increase in flueless heater complaints.

The war-time period is one in which complaints are limited even more than pre-war by the incidence of more important matters than personal comfort or convenience.

Post-War

This period should be characterized by a gas service so sound that there is no cause for complaint. The standardization of appliances and a reduction in price of appliances are matters of first importance, but these aspects are outside the scope of this paper. I am concerned primarily with space-heating appliances dealt with from the point of view of the user. I am chiefly concerned that technical defects recognized before the war, and to some extent dealt with, shall be overcome after the war.

Appliances of the future must fulfil the following conditions: (1) Give a definite service in the home—a service understood equally by the Gas Industry and the user. (2) Give the best possible performance at a known gas rate wherever fitted and whoever fits them. (3) Retain this performance and appearance without attention of the gas undertaking for 5 years. (4) Be simple and cheap in design and modern in appearance. It is probably worth while first to consider the known weaknesses in design of appliances, particularly as they impressed me during my district visit.

Gas fires.—The following weaknesses were apparent in many of the houses visited: (1) Fragile and discoloured radiants. (2) Poor aeration after heavy usage. (3) Unreliable ignition. (4) Discoloration of finish of fires with integral boiling burner.

Radiants.—The tendency just before the war to break away from the present radiant and adopt a separate front structure is most promising. It is possible to design a radiant front using really robust rods or slats—of improved material, greater thickness, and sounder cross section. Using either vertical or horizontal members the performance and appearance is at least as good as the best conventional fire before the war.

Discoloration is largely overcome if the design is such that products of combustion do not pass over the front of the radiant and also if the material of the radiant is deep buff in colour.

Poor aeration.—The effect of dirt and fluff is marked, especially in such places as bed-sittingrooms, and also changes in gas quality may make aeration uncertain. The tendency to change over to luminous burners seems a complete answer.

Unreliable ignition.—It seems likely that flint lighters integral with the cock are too complicated and expensive. A simple flint lighter, as simple as the operating part of a petrol lighter, independent of the cock, seems hopeful.

There is still the possibility that the cold catalyst will become sufficiently reliable to be used extensively.

Discoloration of finish of boiling burner fires.—Advances in heat and products resisting paint help to some extent, but it seems desirable to rely also on a neat independent boiling burner at the side of the fire.

Variation in setting and difficulty of controlling heat output.—An integral governor and a simple proportional cock seem the most likely solution. It is possible that a new design of simple, small, cheap governor is needed, and there is no objection to a slight relaxing of performance standards if necessary to obtain these advantages.

Portable gas fires.—These are of the greatest importance, especially among the poorer auto. consumers, and if used correctly should be used often. The main defects at the moment are very similar to those on flued fires.

Radiants.—Mechanical strength is of first-class importance. Metal radiants were a great advance, but an even more promising development is the robust refractory rod or disc with thorns or ribs to give quick heating up and bright appearance.

Poor aeration.—This is a very real problem and attention should be paid to the use of luminous burners.

Unreliable ignition.—The simplest type of flint lighter is the most likely solution.

Variation in setting.—The integral governor is the most positive solution.

Discoloration of reflectors.—This is largely overcome if the products of combustion do not come in contact with the reflector, a resistant metal such as anodized aluminium is used, and it is made very easy for the user to wipe the reflector clean.

Radiators and convector heaters.—The main weaknesses are: (1) Deterioration of the interior components; (2) discoloration of the outside finish and in particular any grid at which products of combustion come out.

Deterioration of interior components.—It is important that wherever possible the interior shall be of simplest design, and internal heat exchange surfaces should not be used if it is possible to make direct use of the heat in the diluted products of combustion.

Full protection should also be given to the interior surfaces using such finishes as grip vitreous enamel for high temperatures or if initial condensation occurs. There is the possibility of improved stoving paints for protection at lower temperatures.

Discoloration.—It should be possible to keep the outside at a low temperature so that normal stoving paint will be satisfactory, but special finishes are needed at the outlet grid. This grid must not only be of good temperature and products resisting finish, but must be of such a shape that the user can easily keep it wiped clean.

Water heaters.—These were not included in the survey and my own experience is non-specialized. It seems clear, however, that they represent the most difficult long-period maintenance problems. It is felt that there should be a pooling of information on recent development in heat and condensation resisting finishes for the interiors, methods of reducing the temperature gradients in the interior, and methods of minimizing internal condensation. Simplicity of design, standardization of controls and safety devices and easy access to vulnerable parts appear essential.

Cookers.—These again were not covered by the survey. There did, however, seem to be a general impression that the hotplate and the oven were difficult to clean, and in particular odd corners collected dirt and sharp corners made cleaning difficult. It seems important to make parts easily removable or accessible for cleaning rather than attempt to shield them from the inevitable cooking dirt and grease. An extended use of the duplex tap and the use of cocks of the proportional type seem desirable. The possibility of a solid hotplate is worth considering seriously, but it is important to keep in mind the extended use on electric cookers of the radiant type hotplate if there is to be any hope of getting an efficiency at least as high as that at the moment obtained, without the use of special vessels.

The survey did show that a change of heart was needed in the Gas Industry and among the users of gas. A gas appliance should not be regarded merely as an appliance with a certain maximum gas rate, but as a gas-using appliance which will give a definite service for a certain cost. The overall cost of the gas used and the appliance itself on an annual and a weekly basis need properly understanding by the user.

Space Heating

Living room.—Three factors must be appreciated:

1. This room needs heating for long periods for about seven months of the year, and whatever else happens this heating will take place. A gas fire can give a similar heating service to a coal fire at the same cost for fuel if coal is 2s. 6d. a cwt. and gas is 5½d. a therm, even using pre-war normal gas fires. The annual gas consumption is of the order of 250 therms. The cost of the appliance will be small compared with the money spent on fuel.
2. Additional background heating for 70 days will make an enormous difference to the comfort conditions, and if done by gas will probably mean an annual gas consumption of 30–60 therms. The cost of the appliance becomes significant.
3. A flueless gas fire for between-season heating is a considerable economy with a slight drop in the comfort standard. If it is used for the two milder months a saving of about 50 therms is to be expected compared with the constant use of a flued gas fire. This 50 therms represents a saving of about 15 cwt. on a coal fire.

* Paper to the London and Southern District Junior Gas Association, Sept. 25.

Care must be taken in considering the living room for very small houses or when every penny of cost is important. The greater period of the day may then be spent in the kitchen, which may or may not be big enough to be called a kitchen living room. Cooking, and often water heating, keeps the kitchen warm in the winter, and the living room proper will only be occupied in the evening or on a limited number of days. Such intermittent use will reduce the amount of gas used in a gas fire, and completely alter the comparative cost of heating by gas and solid fuel in favour of gas.

Hall.—This is probably the most abused part of the house. Heating here is of the greatest importance to the comfort of the whole house. In small houses the heat from the kitchen helps to keep the hall and the rest of the house reasonably warm except in the really cold weather. It is in the really cold two months that additional heat will make a very real difference to the comfort of the hall itself and the house generally. In larger houses some heat is needed all through the winter. A flueless heater rated at 10 cu.ft. per hour will normally be adequate, and will give a great comfort contribution for an annual consumption of about 30–50 therms.

Dining room.—The convention of fitting a large gas fire appeared to be regarded as admirable by most of the users, but it is felt that this was due to a low comfort standard. Quick heating up and a wide distribution of comfort is normally needed, and the best service would be given by a combined radiant and convector heater—either a convector type fire or a fire and background heater. A reasonably normal consumption is 25–50 therms a year for a gas fire with a reduction of 10–20 therms a year if a convector type fire were used. If money is of first importance a flueless fire is preferable, giving a lower comfort standard, but halving the gas consumption.

Kitchen.—If solid fuel is used for water heating the problem of heating does not normally occur. If gas is used for water heating then a flueless fire is desirable. A typical consumption is 25 therms a year.

Bedrooms.—To many a gas fire in a bedroom is regarded as a luxury, except for illness, but a consumption not exceeding 25 therms a year is adequate for giving short-period heating in the colder weather in a 3-bedroomed house. A high heat output radiant fire is desirable providing the room is large enough for the fire to be alight without fear of scorching the surroundings. In small rooms the positioning of the fire is a difficult matter and most fires seen in such rooms were probably not used. The capital cost of the fire is of the greatest importance, as it represents a high proportion of the annual cost of appliance and fuel. If a higher standard of ventilation is agreed on in bedrooms the extended use of flueless heaters in all bedrooms but one needs carefully considering.

Water heating.—It seems to be clear that after the war the greatest importance will be attached to adequate hot water supply and bathing facilities. A careful balance must be made between the total amount of money which is available to spend on water heating, and how this is spread out between the cost of the appliance and the cost of fuel. An all the year round gas hot water service could be obtained with a consumption as low as 130 therms a year. It is probable that a number of people would prefer to retain independent solid fuel boilers in the winter with facilities for gas topping up and with a full gas hot-water service in the summer. Such a gas service could be given for a consumption of the order of 60 therms a year. The general experience of back boilers and kitchen ranges does not seem to be so favourable as that of independent hot water and space-heating services and this is to be expected.

Appliances to Fulfil a Definite Need

The following types of appliance appear desirable, and up to the war were either not available or were available in primitive form:

Space Heating.

1. A fire of high maximum heat output and a low minimum output with good appearance. The maintenance rate of a high efficiency fire in a small living room, especially in milder weather, should be one-third of the maximum rate. In order to use a relatively expensive fuel to the best advantage full flexibility should be assured.
2. A fire giving the "cosy" and "homely" appearance of a coal fire. Rightly or wrongly, this desire was apparent with most households for the living room, and a special point was made of discussing this question at each visit.
3. An inset type of fire of modern appearance.
4. A fire giving the maximum possible efficiency so that the running cost could be kept as low as possible for long periods of use.
5. A fire giving air heating as well as radiant heat in order to speed up the general heating of a room. This is of particular importance for the dining room, where there is often strong opposition to fitting an extra background heater. This type of fire appears to give the greatest hope of a marked increase in total heating efficiency.
6. Really cheap fires of modern high performance for bedroom use or in any room where usage of gas is small.
7. A cheap heater for halls. Preferably at least one model should fit into the corner of small halls where there is little space available. Some radiant heat and some appearance of incandescence are desirable, although the primary function is to give warm air.
8. Simplified thermostatic control of gas fires as well as air heaters to be developed.

The general points already mentioned on improved design apply throughout.

Water Heaters.

1. Appliances of lower capital and maintenance cost.
2. The simplest type of circulator that could be linked up with a coke boiler for summer use and for topping up as required.
3. A heater of such low heat capacity that small quantities of hot water could be obtained at a really high efficiency.

Co-operation of Laboratory and District

Experience in the past has shown the immense value of really close co-operation between laboratory and district personnel. I feel that everything possible should be done to strengthen this link. It is not enough for the laboratories to leave the initiative in the hands of the district sales and service staff. Visits from the laboratory at regular intervals to the district with the district personnel with special reference to complaints, and visits from the laboratory alone and on a "no complaint" basis seem to me to be invaluable. The laboratory could also co-operate to the fullest extent to obtain statistics on complaints and on annual fuel consumptions of different types of consumer.

There is one other development of the past which has proved of immense value and could properly be extended greatly—the Home Test system, by which appliances are on free loan for limited periods to various members of the staff. If the Home Test facilities were extended to a greater range of people and covered more appliances, it might go a long way towards solving the problem of the customer who will not complain.

There can hardly be a more critical but fair user than the man who wants to extend the use of gas, but knows that he will be responsible for the initial sale or for service after the sales.

On scientific grounds it has been shown many times that gas is in a stronger position than any other fuel to supply the greater part of the fuel needs for the home. Gas and coke together should occupy an invulnerable position. They should give the desired service to the satisfaction of the individual user, the community, and the national fuel supply.

In order to obtain this place for gas there must be a greater knowledge of the facts, a greater urge to sell gas on its real merits, and complete co-operation between every section of the Gas Industry and every manufacturer.

Discussion

The **President** (Mr. G. Dougill) confirmed that in general the consumer did not complain about the defects in the performance of appliances which had been mentioned in the Paper. There was, for example, the poor aeration of gas fires, due to the effect of dirt and fluff. They in the Gas Industry knew how simple it was to remedy this, but the ordinary consumer did not, and accepted the inferior performance as inevitable, and formed his opinion of gas service accordingly. Mr. Dougill suggested that attention might well be paid to the development of a gas fire giving a measure of air heating as well as radiant heating, and thought the small hall heater held much promise.

Mr. **R. J. Pepper,** in a letter read at the meeting, corroborated from his own experience the findings of the Author, emphasizing that in the co-operation between laboratory staffs and those engaged on the district the sales personnel could and should play their part, and their suggestions should be properly considered in the development of appliance design.

Mr. **Andrew** agreed that the sales staff should investigate complaints and make their recommendations.

Mr. **P. F. F. Clephane** queried whether, with aerated burners, there was a solution to the problem of inferior aeration of the burners due to the accumulation of fluff.

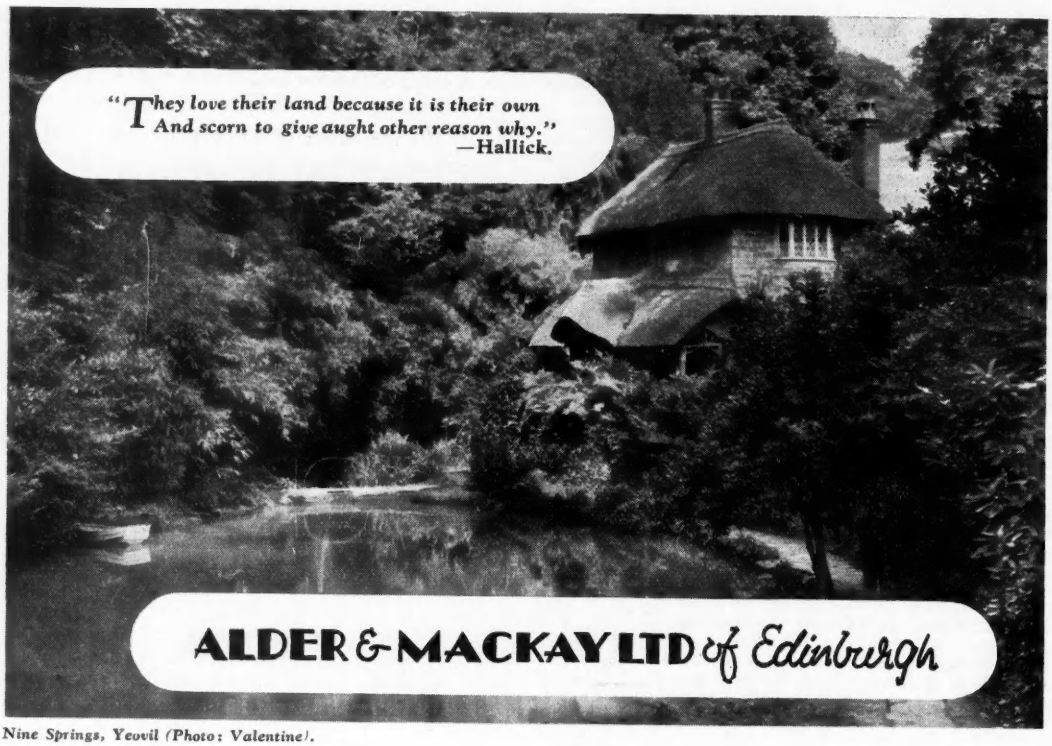
Mr. **Andrew** thought not, but considered that burners with luminous flames did provide a solution.

Dr. **G. E. Foxwell** asked whether, on principle, it was right to recommend the use of flueless heaters. He had been told by a gas executive that flueless heaters caused more trouble than any other apparatus—that condensation of the products of combustion spoilt wallpapers and caused fading of the colours of curtains.

Mr. **Andrew** remarked that under certain conditions of use—inadequate ventilation and a gas rate too high in relation to the contents of the space to be heated—flueless heaters were undesirable. But, in his experience, he could count on his fingers the few complaints received from the use of 300,000 flueless heaters, and the reasons for these few complaints could be traced to unintelligent use or fitting and ventilation well below the standard needed and recommended. With adequate ventilation and correct initial rating there was no reason to anticipate any trouble, and he would mention that flueless heating was recommended primarily for between-season heating. Moreover, as cost was an important consideration, flueless heating was often the right method to advocate.

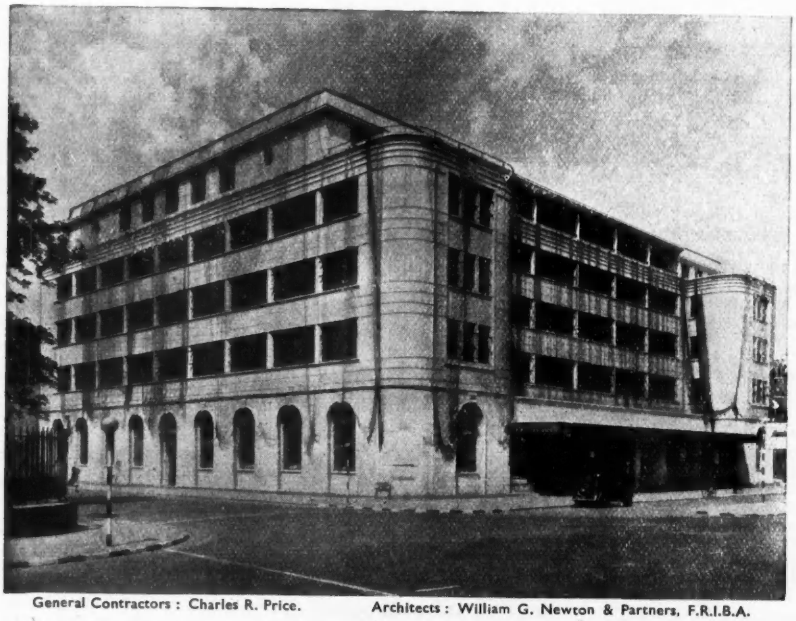
Mr. **C. A. Deas,** who spoke of his satisfactory experience with one type of electric ignition, asked whether it was expected that a gas appliance would in fact function well for a period of five years without any maintenance.

Mr. **Andrew** replied that he had little doubt that such an expectation—he excepted water heaters—could be realized.


"They love their land because it is their own
And scorn to give aught other reason why."
—Hallick.
ALDER & MACKAY LTD of Edinburgh

Nine Springs, Yeovil (Photo: Valentine).

GAS FOR MODERN BUILDINGS



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Mr. **Blandon,** referring to the high proportion of capital cost of water heaters in the total cost of service gained from them, held out hopes for simpler and cheaper designs in the future.

Mr. **Watson** thought that perhaps the concentration on the radiant efficiency of gas fires had gone too far, and that they might be able to reduce the capital cost of fires if they accepted some reasonable reduction in their radiant efficiency.

Mr. **Andrew** said he was thinking of the greatly extended use of gas fires after the war, and, for continuous use, high thermal efficiency was obviously important in relation to cost. Their aim for fires intended for such use should be high efficiency combined with easy maintenance.

Mr. **F. C. Smith** suggested that there was the well-informed consumer who was perfectly satisfied with the performance of his gas appliances, and the well informed consumer who had a poor opinion of the Industry's service but who did not think it worth while to complain. The Industry, he continued, did not give a 100 per cent. perfect service, and some people, uninformed of what gas could really do, took the service they received for granted and did not complain. Turning to the question of space-heating appliances giving, without maintenance, service free from trouble for five years, he suggested that this could be accomplished if in the first place they got rid of the sulphur compounds in the gas, if they kept the quality of the gas constant, and if they supplied the gas at constant pressure. He felt there was great need for more simplicity in design, and that in the past there had been far too much of a tendency to incorporate "gadgets" in appliances. They could, he was sure, better serve the general public by offering them simpler apparatus. Water-heating appliances were a more difficult proposition, but no doubt advances could be made by the use of new materials of construction. Then, of course, there was the all-important matter of cost. A Government survey pre-war had shown that the low-income class could afford to spend only something like 4s. to 6s. a week on fuel—*i.e.*, total fuel, including lighting and wireless. This boiled down to the fact that the average person could only afford to heat one room comfortably. It was a question of coppers per week on the use of gas appliances, and they must shape their policy in the light of facts such as these.

Mr. **Andrew** said he thoroughly agreed that the public should be educated regarding what efficient gas service meant. Regarding the amount of money the average consumer had available for expenditure on fuel—say, 4s. to 6s. a week, as had been mentioned—calculations showed how gas at 6d. a therm could compete with solid fuel. Development was, of course, bound up with the cost at which gas could be supplied.

Mr. **Warne** spoke of the adequacy or otherwise of service and carcass pipes to cope with increased demand for gas, and the possibility of having to re-carcass premises if they were to satisfy this demand in the future.

Mr. **Andrew** suggested the advisability of designing appliances to operate at low gas pressures—appliances having a low pressure drop.

Messrs. **J. Robertson** and **T. A. Wolfe,** in a written contribution, stated that in the area of the Tottenham Company the professional or frivolous complainer was almost non-existent. This did not mean, however, that they did not get recurring complaints, and almost always they found good reasons for complaints which warranted full investigation. Mr. Andrew had envisaged an appliance of the future which would work satisfactorily without attention for at least five years, and some speakers had doubted whether this would be possible. According to the Tottenham Company's records, the average attention given to appliances were as follows: Cookers, one visit per 10.3 years; gas fires, one visit per 17.7 years; coppers, negligible; radiators, one visit per 5.0 years; water heaters, one visit per 2.2 years; refrigerators, one visit per 1.1 years; coke grates, negligible. Cookers, fires, coppers, and coke grates would therefore appear to be virtually trouble-free, although the possibility of a large number of gas fires not being used must not be overlooked. Moreover, fires that were in constant daily use during the winter required much more frequent attention than the average. The "built-in" fire was troublesome owing to mortar rubble falling into the nozzles. This could doubtless be cured by modification of design in the shape of a hood incorporated in the flue outlet of the fire. The real offenders without doubt were refrigerators and water heaters. The chief faults in refrigerators were thermostat defects and dirty flues, and the causes of failures in water heaters were varying water pressure, pilot defects, and foreign matter in water valve or in gauze. Remedies for the last three would appear to be water pressure governors as an integral part of the appliance; removal of corrosive agents in gas; and dirt trap of an improved design.

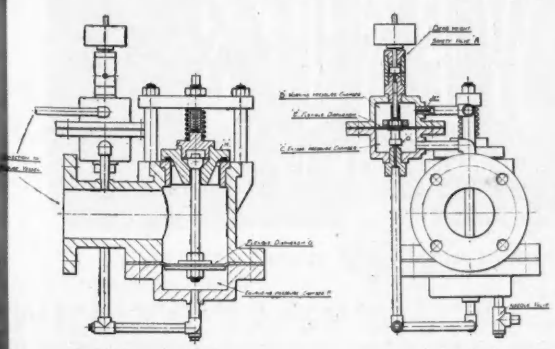
Pressure Loaded Safety Valve for High Pressure Gas Storage Plant

Since the introduction of high-pressure storage of gas, one of the main sources of trouble has been the "safety valve" on the container. The gas is usually pumped into the container by means of an electrically driven compressor, and when the pressure reaches a predetermined figure the electric current is automatically cut out and thus the plant is stopped, but should the automatic arrangement fail, the compressor continues to force gas into the container until such time as the safety valve comes into operation.

To take an example, suppose the compressing plant is set to cut out at 77 lb./sq.in. The safety valve would be set to blow at, say, 80 lb. sq.in. in order to give a margin for gas expansion in the containers, etc. From actual tests on spring and weight-loaded safety valves it was found that when the container pressure reached to within 5 lb. of the set pressure the valve would commence to ease off the seat and thus allow a serious wastage of gas. Also, once the valve had started to blow, it would take a pressure drop of approximately 7 lb. before the valve finally closed.

Thus, in the example stated, it would mean that in order to save a serious wastage of gas the plant would have to be set to cut out at 77 lb. in order to give the margin of 7 lb. This in itself meant a reduction in the storage capacity of the containers. After various experiments were carried out, two main conclusions were drawn:

1. The usual construction of a safety valve, in which the pressure rises and so tends to balance the pressure of the weight of spring, was entirely wrong—the danger being the higher the pressure the greater the chance of leakage between the valve and seat.
2. The effects of pulsations from the compressor definitely tended to make the ordinary type of safety valve leak, once the pressure reached within 5 lb. of the set pressure, due again to the nearness of the pressure on the valve balancing the effects of the spring or weight.



Bearing these two main conclusions in mind, experiments were carried out and eventually the design of valve illustrated was evolved.

From tests carried out on this type of valve, it was found to work very efficiently at varying pressures from 20 to 80 lb. per sq.in., and would be just as satisfactory on higher pressures. The tests also proved that the valve would open and close within a margin of approximately 2 lb. of the set pressure.

Thus it was possible to increase the storage capacity of the containers and at the same time reduce the risk of leakage.

The valve essentially consists of two main parts—viz., the control apparatus and the main valve. The control apparatus consists of a small dead weight safety valve and a control chamber divided into two compartments by means of a flexible diaphragm to which is attached a small valve. The main valve body is of cast iron construction and is provided with a flange for connecting to the container. A large valve and seat is fixed at one end of the tee portion, and at the opposite end is fixed a flexible diaphragm. The main valve is attached to the diaphragm by means of a spindle. The effective area of the valve and of the diaphragm is in the approximate ratio of 1–2.

From this it will be clearly seen that the pressure acting on the diaphragm always ensures that the main valve is held down tightly upon its seat, and the higher the pressure the tighter the valve. This method of construction, therefore, gets over the two main difficulties as previously stated.

It will be seen from the accompanying drawing that on top of the valve is indicated a spring and an adjustable set screw. The spring is of light construction and is merely intended to keep the valve on its seat when "no pressure" conditions exist in the container. The adjustable set pin is set to prevent the uplift of the valve being excessive and thus tending to distort the main diaphragm.

The small dead weight safety valve A is set to blow at any desired working pressure. This ensures the pressure in the working pressure chamber B being kept constant. As the safety valve A will not be large enough to pass any large volume of excess pressure, the pressure in the excess pressure chamber C will commence to rise and lift the valve D attached to the flexible diaphragm E. This will allow a pressure to be built up in the equalizing pressure chamber F sufficient to balance the difference in pressure acting downwards on the flexible diaphragm G, and upwards on the valve H. The main valve will then commence to lift, and blow off surplus pressure. As soon as the pressure falls to "working" the diaphragm E will fall and close valve D. The pressure in the chamber F will then reduce to atmosphere via the needle valve, and the main valve H will fall and close, thus reverting to the original conditions.

A patent on the above lines has been applied for jointly by Mr. C. M. D. Belton, Director, Engineer, Secretary, and Manager of the Shrewsbury Gas Light Company, and Mr. H. Bott, and a provisional cover has been duly obtained.

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Gas Products Prices

The London Market Oct. 12.

The only item of interest in connexion with the London Coal Tar Products market is that fair quantities of Pitch are being sold on the basis of 45s. per ton naked at Makers' Works. Otherwise no change.

The Provinces Oct. 12.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d; timber preservation and other purposes 4¾d. to 6d. These prices apply as from May 13.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Oct. 10.

Market continues active with prices firm. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6¾d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6¾d. to 7d. per gallon; all *ex* Works in bulk. Cresylic acid is readily disposed of at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. Solvent naphtha: 90/160 grade, 2s. 3d. to 2s. 6d., and 90/190 Heavy naphtha, 1s. 9d. to 2s. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

There was a renewal of activity at the opening last week and on Monday markings reached a new record since the publication of official figures. At the close, however, markets became somewhat irregular although the tone remained firm. Gas stocks and shares were in good demand throughout the week and with only one exception—a small drop in South Metropolitan ordinary—all prices were in an upward direction. It is satisfactory to note a further rise in Commercial ordinary with stock changing hands at 41, a price not reached for some time past. Oriental with a gain of 2½ points was another good feature and Gas Light units closed 3d. higher for the second week in succession.

The following price changes occurred during the week:

OFFICIAL LIST

Associated Gas & Water Undertakings Ord.	17/6—18/6	+–/9d.
Bombay Ord. (x.d.)	18/6—20/6	Oct. 5
Commercial	37—42	+2
Croydon max. Div.	84—89	+1
Gas Light Units	13/6—14/6	+–/3d.
Ditto 4 p.c. Pref.	67—72	+1
Imperial Continental	66—71	+1
Oriental Ord.	85—90	+2½
South Metropolitan Ord.	56—61	–1
Wandsworth Ord.	82—87	+1

SUPPLEMENTARY LIST

Croydon 4 p.c. Deb.	97—102	+2

PROVINCIAL EXCHANGES

Bath Cons. (x.d.)	97—100	Sept. 28
Newcastle 4 p.c. Pref.	93—94	+½

At an Extraordinary General Meeting of Associated Gas and Water Undertakings, Ltd., on Oct. 1, resolutions subdividing the 972,345 Ordinary Shares of £1 each into 1 Ordinary Share of 12s. and 1 Deferred Share of 8s., together with the alterations to the Articles of Association consequential thereto, were passed unanimously.

The Secretaries have pointed out to us that in our full Stock Table published last week the statement of the dividend paid on the Ordinary Shares of the United Kingdom Gas Corporation, Ltd., was misleading. For each of the three years to Dec. 31, 1939, there was paid an interim dividend of 2% and a final of 3%, making a total of 5% for each of these years. For the year ended Dec. 31, 1940, no interim dividend was paid, and a final dividend of 4% was declared—a total of 4% for the year. For the year ended Dec. 31, 1941, an interim of 2% and a final of 3% were paid, making 5% for the year.

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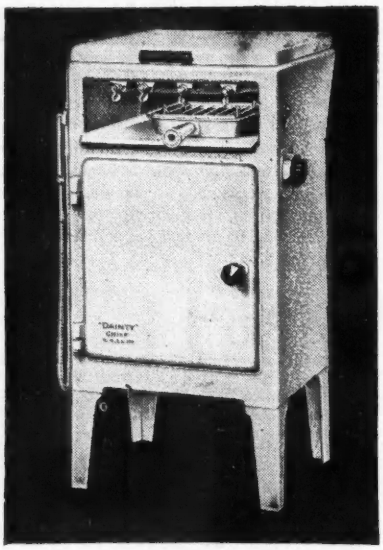

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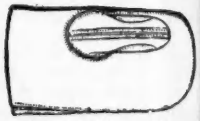

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CONTENTS

EDITORIAL NOTES

Fuel Needs of Carbonizing Plant . 91
Home Service 92
Coke Supplies 92
Directorate of Gas Supply . . . 92

Personal 92

Obituary 93
Letters to the Editor 93
National Gas Council 94
Yorkshire Junior Gas Association . 94
"Unity in Diversity." By W. M. Selvey 97
Coke Quality 98

Organizing a Fuel Economy Exhibition . 103
Reducing the "Unaccounted-for". . 105

Gas Products Prices . . . . S. 1
Gas Stocks and Shares . . . S. 1

THIS WEEK'S ADVERTISERS

	PAGE
Alder & Mackay, Ltd.	S. 2
Bagnall, W. G., Ltd.	79
Bale & Church, Ltd.	S. 4
Belliss & Morcom, Ltd.	79
Blakeley, Firth, Sons & Co., Ltd.	S. 4
Braddock, J. & J., Ltd.	104
Bratt Colbran, Ltd.	81
British Thomson-Houston Co., Ltd.	85
Broadbent, J. C., & Co., Ltd. ...	S. 3
Cowan, W. & B.	Cover III
Crane, Ltd.	83
Crossley, Bros.	80
Curtis, A. L.	S. 3
Dempster, Robert, & Sons, Ltd.	S. 4
Donkin Co., Ltd. (The Bryan)	Cover II
Ellison Insulations, Ltd.	S. 4
Evans, Joseph, & Sons (Wolverhampton), Ltd.	80
Fluxite, Ltd.	S. 4
Gas Meter Co., Ltd.	86
Gas Purification and Chemical Co., Ltd.	S. 4
Gerber Power Units	S. 3
Glenboig Union Fireclay Co., Ltd.	87
Glover, George & Co., Ltd. ...	77
Glover, Thos., & Co., Ltd.	Cover I, 90
Goodall, Clayton & Co., Ltd. ...	S. 3
Grant, David, & Co.	85
Green & Boulding, Ltd. ...	S. 4
Griffith, Bros., & Co. (London), Ltd.	99
Hamilton, Archd. H., & Co., Ltd.	82
Holmes, W. C., & Co., Ltd. ...	S. 5
Humphreys & Glasgow, Ltd. ...	88
Johnson, C. H., & Sons, Ltd. ...	82
Keay, E., C. & J., Ltd.	S. 6
Keith Blackman, Ltd.	S. 6
Kings Patent Agency, Ltd. ...	S. 4
Le Bas Tube Co., Ltd.	84
Londex, Ltd.	S. 3
Main, R. & A., Ltd.	102
Menno Compressed Air Greasecup Co., Ltd.	S. 4
Mewburn, Ellis & Co.	S. 4
Mitchell, H., & Co.	S. 3
Morton, Joseph, Ltd. ...	Cover IV
Newton Chambers & Co., Ltd.	96
Oxley Engineering Co., Ltd.	Cover II
Parkinson, W., & Co.	90
Pulsometer Engineering Co., Ltd.	Cover IV
Radiation, Ltd.	100, 101
Siebe, Gorman & Co., Ltd. ...	S. 3
Sperryn & Co.	89
Strachan & Henshaw, Ltd. ...	77
Thomas & Bishop, Ltd.	S. 1
Trotter, Haines & Corbett, Ltd.	S. 4
Turbine Furnace Co., Ltd. ...	82
Underpressure Engineering Co., Ltd.	78
Walker, C. & W., Ltd.	S. 2
Waller, Geo., & Son, Ltd. ...	78
West's Gas Improvement Co., Ltd.	106
West's Piling & Construction Co., Ltd.	Cover IV
Woodall-Duckham Co., Ltd. ...	95
Trade Cards	S. 1
Appointments Vacant	S. 4
Contract Open	S. 3
Patents	S. 4
Plant, &c.	S. 4
Plant, &c., For Sale and Wanted	S. 3

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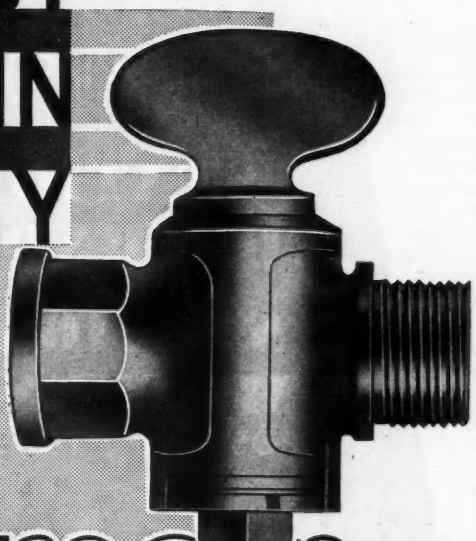

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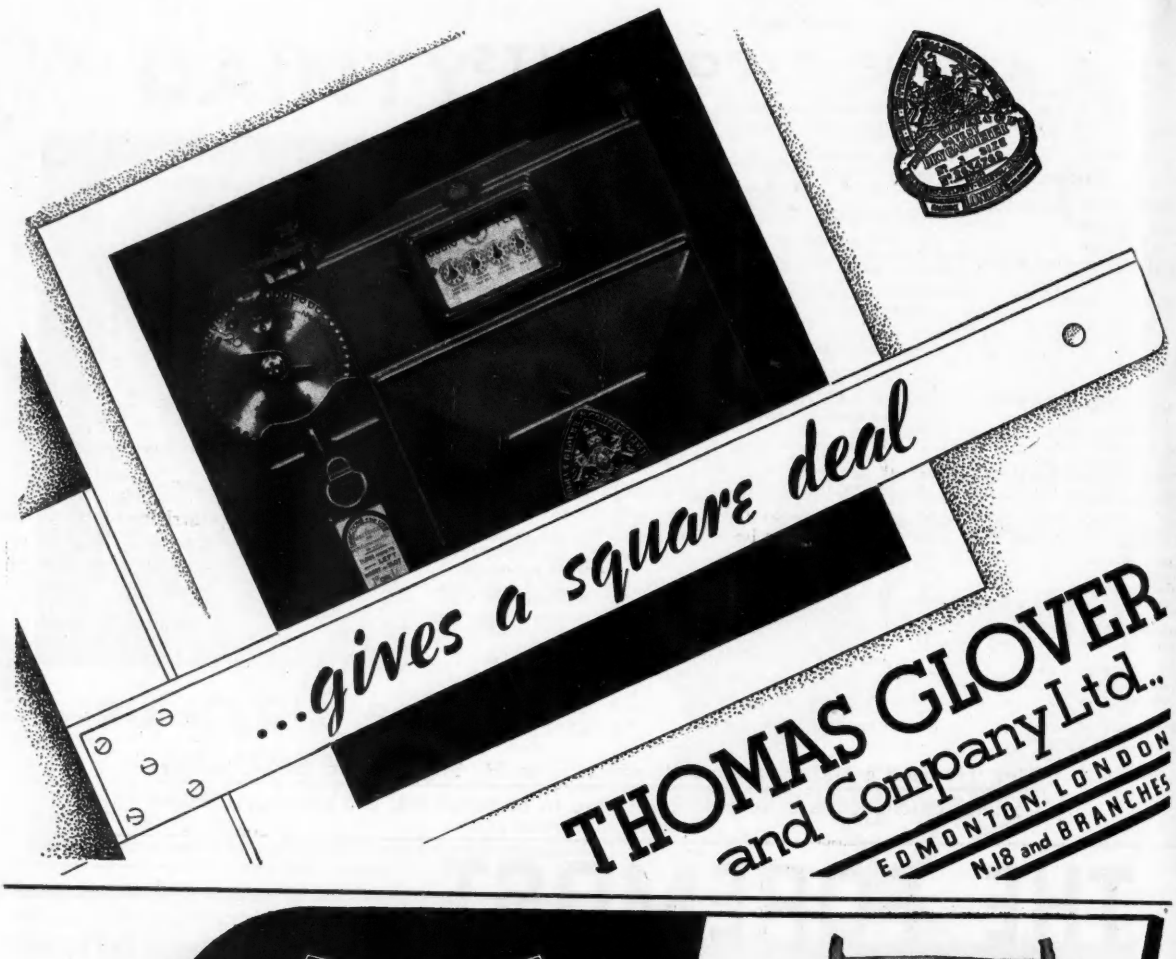
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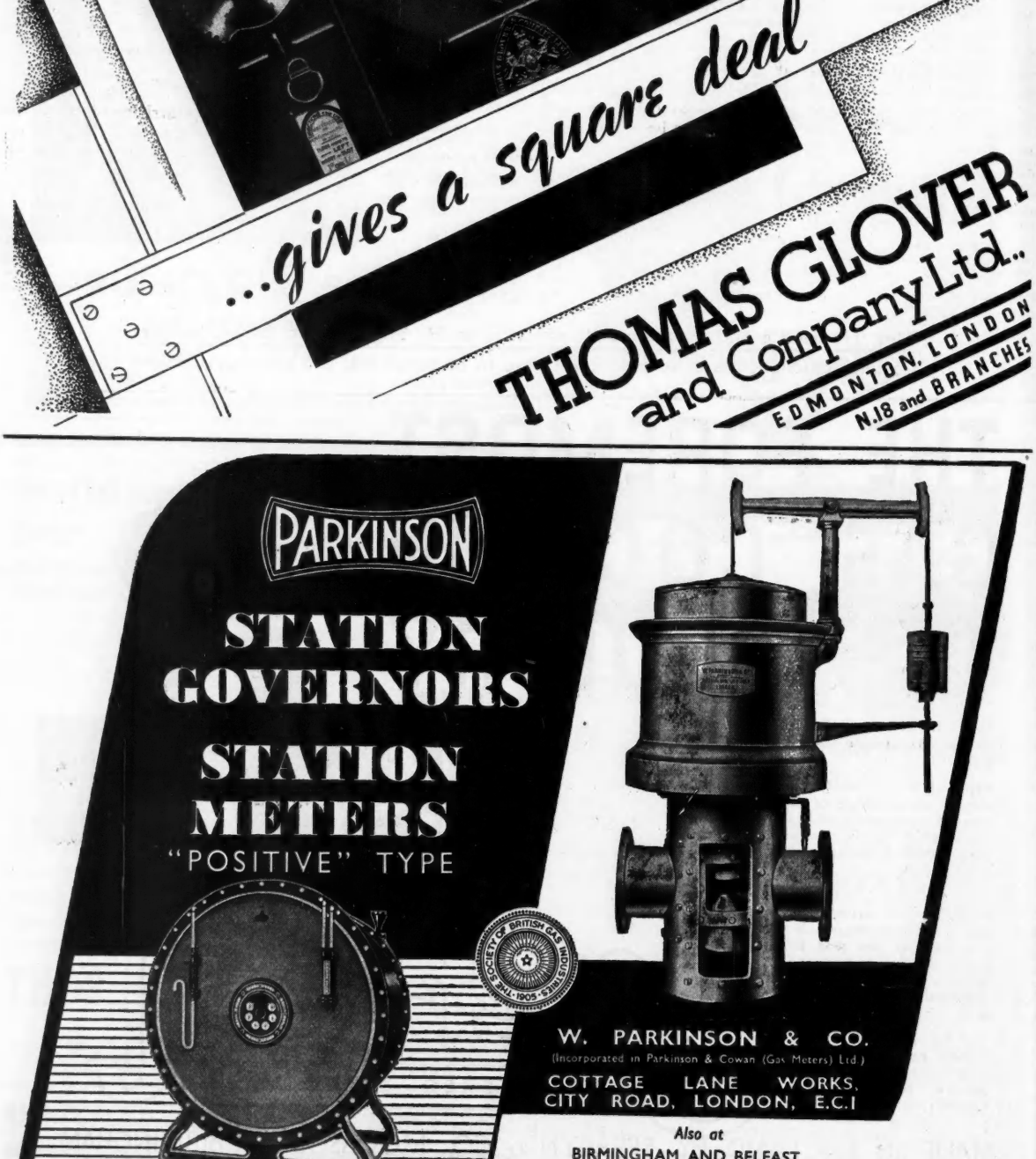
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